PROCEEDINGS OF THE

AMERICAN PHILOSOPHICAL SOCIETY.

HELD AT PHILADELPHIA, FOR PROMOTING USEFUL KNOWLEDGE.

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PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY.

VOL. X. JANUARY, 1867. No. 77.

Stated Meeting, January 4, 1867.

Present, sixteen members.

Dr. WOOD, President, in the Chair.

A letter was read from J. P. Lesley, dated Paris, France, December 10, 1866, tendering his resignation as Secretary and Librarian of the Society.

The photograph likeness of Rev. William Jenks was received for insertion in the Album.

Donations for the Library were announced from the following sources: From the Royal Prussian Academy at Berlin; from the Geographical Society at Paris; the Annals of Mines at Paris; from the Geological and the Royal Astronomical Societies of London; from the American Antiquarian Society at Worcester, Mass.; from the United States Sanitary Commission, and from Mr. Isaac Lea, of Philadelphia.

The decease of a member, Rev. William Jenks, was announced, as occurring 13th of November, 1866, in the 88th year of his age.

Prof. George Allen was appointed to prepare an obituary notice of the late Prof. Vethake.

The report of the Judges who conducted the election held this day was read, and the following named officers were declared duly elected according to the laws, ordinances, and regulations of the Society for the ensuing year:

President.

George B. Wood.

Vice-Presidents.

John C. Cresson,
Isaac Lea,
George Sharswood.

Secretaries.

Charles B. Trego,
E. Otis Kendall,
John L. Le Conte,
J. Peter Lesley.

Members of the Council for Three Years.

Alfred L. Elwyn,
John Bell,
Benjamin H. Coates,
Benjamin V. Marsh.

Curators.

Franklin Peale,
Elias Durand,
Joseph Carson.

Treasurer.

Charles B. Trego.

J. P. Lesley, Thomas P. James, and Charles B. Trego, were placed on nomination for the office of Librarian.

Pending nominations, Nos. 552 to 554, and 557 to 567, were read.

Prof. J. C. Cresson was appointed to fill a vacancy on the committee to collect funds for a fire-proof building.

And the Society was adjourned.

Stated Meeting, January 18, 1867.

Present, twenty-four members.

Dr. Wood, President, in the Chair.

Letters were read from the Royal Society of Sciences at Göttingen, October 13; from the Society of Natural Sciences at Altenburg, October 8; from the Society of Natural Sciences at Riga, 9th and 31st May, announcing donations. Also, from the Royal Society at Göttingen, October 10; from the Society of Natural Sciences at Emden, October 1; from the Society of Natural Sciences at Riga, May 31; from the Smithsonian Institution, Washington, August 2d, acknowledging receipt of publications.

Donations for the Library were announced: from the University of Kharkof, Russia (five treatises in the Russian language); from the Society of Natural Sciences at Riga; from the Royal Society of Science at Göttingen; from the Royal Society of Science at Leipsig; from the Royal Prussian Academy of Science at Berlin; from the Society of Natural Science at Emden; from the Royal Library at Munich; from the Imperial and Royal Geological Society at Vienna; from the Royal Academy of Sciences at Belgium; from the Society of Naturalists at Manheim; from the Society of Natural Sciences at Bremen; from the Society of Natural Science at Altenburg; from F. Zantedeschi; the Annals of Mines; from the Royal Geographical Society of London; from the Essex Institute, Salem, Mass.; from the American Pharmaceutical Association; from the publishers of the American Journal of Medical Sciences, and the Medical News and Library, Philadelphia.

The death of Gen. Lewis Cass, a member, was announced by Prof. Trego, as having occurred June 17, 1866, aged 82 years.

The death of William Norris, a member, was announced by Mr. Fraley as having occurred.

Dr. Hayden made some remarks and observations in regard to the lignite beds of the country on the upper tributaries of the Missouri.

He stated that he had recently received a number of interesting letters from various parts of the far West, communicating important geological discoveries which he was anxious to have recorded in a scientific journal as soon as possible, that the attention of other explorers might be directed to them. Although the great Valley of the Missouri and its tributaries has already yielded so many important facts to geological science, it does not seem even yet to have given up half its wealth.

1. Dr. Curry, an intelligent surgeon, now of Baltimore, Maryland, formerly of the United States Army, and stationed at Fort Sully, on the Missouri River, writes as follows: "I received a letter a few days ago from Fort Rice (Captain Irvine), who says, 'While in charge of the herd a short time since, I discovered the bones of some huge extinct Behemoth. The dimensions of the largest is as follows: from head of femur to inner condyle, forty-two inches; from head of femur to trochanter major, twenty inches; long axis of femur, thirty-nine inches; short axis of femur, eight inches; from condyle to condyle, fifteen inches. Other bones in vast quantities were found, but were so crumbled by exposure to the elements, that it was difficult to arrive at any correct conclusions in reference to them; enough, however, is known, that this region once abounded in tropical plants and animals, and the remains thereof will yet afford vast treasures of geological interest to the student both of Europe and this country, and the day will come when the spectacled antiquarian will make annual pilgrimages to the Bad Lands of Dacota.'"

Fort Rice is located at the mouth of Cannon-ball River, a tributary of the Missouri, which rises in the prairie near the eastern base of the Black Hills. The bones referred to were found on the southern rim of the Great Lignite Basin, a district of the highest interest. These bones are distributed in greater or less abundance south and southwestward, even to the east base of the Black Hills. In Dr. Hayden's explorations in former years, he discovered the remains of several extinct animals along this southern rim of the Lignite Basin, which have been described by Dr. Leidy in the Transactions of the American Philosophical Society, 1859. The first one described, Dr. Leidy called *Ischyrotherium antiquum*, and says, "We

cannot positively determine the affinities of the animal represented by these bones, but from their solidity of structure, and the cylindroid form of the ribs, we suspect *Ischyrotherium* to be more nearly allied to the Manatee than to any other known animal."

"Though I have supposed the remains above described to indicate the former existence of a mammal allied to the Manatee, they yet appear to me of such singular character, that I have suspected they may have belonged to an aquatic reptile, unlike any known, and perhaps foreshadowing in its constitution the sea-cows, just as Iguanodon appears to have foreshadowed the herbivorous pachyderms of the Eocene tertiary period." A huge saurian has been indicated by Dr. Leidy by remains found in this region, to which he has given the name of *Thespesius occidentalis*. "Several vertebral, together with a first phalangeal bone, from Nebraska, appear to indicate a deinosaurian as colossal as the *Iguanodon* of England, or the *Hadrosaurus* of New Jersey. Two of the specimens are exceedingly like mammalian lumbar vertebræ, especially those of the elephant or mastodon, and might readily be taken for such, were it not that they possess well-marked processes for the articulation of chevron bones."

The remains of two species of turtles were discovered not far from Fort Rice, *Compsemys victus* and *Emys obscurus*. Dr. Leidy also describes some very interesting fish remains from this portion of the Lignite Basin, under the name of *Mylognathus priscus*. "The very singular-looking fish, *Chimæra*, of the European seas, was represented during the Miocene period in Nebraska, by a genus for which the above name has been proposed. Its former existence is indicated by specimens of dental plates, like those of *Chimæra*, adapted to the crushing of mollusca and crustacea used as food. The specimens, consisting of an upper maxillary and a premaxillary plate, were obtained by Dr. Hayden from the Great Lignite Basin, near Long Lake, Nebraska (now Dacota)." Dr. Hayden remarked that he referred to the fossils mentioned above, in order that the attention of travellers might be directed to them, and that more abundant and better specimens could be secured, that all doubtful points in regard to their affinities might be cleared up.

2. Dr. Curry describes what he calls a "Moss Rock." "This rock can be found at a place known as Spring Lake, situated about ten miles south of New Fort Sully, near the road leading from thence to the old fort, and about three-fourths of a mile from and in sight of the river (Missouri). It is about twenty feet high, and stands out

rather prominently from the side of the hill looking toward the south. A number of large springs have their origin in the hill above it, and their streams uniting, fall over the summit of the rock, forming a very beautiful little cascade, and at its base Spring Lake, the best drinking-water and the coldest I found in Dakota.

"The rock appeared to me the result of successive growths of moss, each petrifying in its turn, and forming a base for the next growth, as with my knife, the only instrument I had with me at the time, I raised several layers of different thicknesses, each one showing well-defined tendrils of moss, reaching through the whole substance. The upper layer shows very beautifully the moss in different stages of petrifaction, the process seemingly complete at its base or one side as you may please to term it, while the same moss is green and growing upon the other. How much of this rock is thus constituted I cannot say, but I think the probabilities quite strong that a large portion of it is petrified."

3. "The rock upon which are found the foot-prints is about ten miles east of New Fort Sully near the right bank of a creek called there the Wá-ka-bó-zhu, lying upon the side of the hill. Some six or eight feet square of the rock is exposed upon which the foot-prints, six in number, are seen. From their size, I presume they were made by a child five or six years of age, and with a well-formed foot. The prints are perfect and distinct, and if natural, must of course have been made while the rock was yet in a plastic state."

Dr. Hayden remarked that the spring referred to above was of interest to him, from the fact that he did not know of one of a similar character in the Valley of the Missouri. The tracks were first seen by General Harney in 1826, when as a lieutenant he ascended the Missouri under General Leavenworth. Dr. Hayden had spent much time in endeavoring to find the locality in former years, but had failed. The causes of these phenomena are plain, and will be apparent to all scientific men.

4. Dr. Hayden also said that he had received a number of interesting communications in regard to the geology and natural history of Colorado Territory from Mr. E. L. Berthoud, a civil engineer, residing at Golden City, now Speaker of the Colorado Territorial Legislature. Mr. Berthoud is a good botanist and mineralogist, and in his statements he placed great confidence. In a recent letter, bearing date of December 18th, 1866, he had communicated to him some very interesting facts in regard to the lignite beds near Den-

ver City. When we reflect that these Western plains are almost destitute of forest trees, and that the great Pacific Railway is soon to pass near this region, or perhaps through the basin itself, the value of these lignite beds cannot be too highly estimated. Accompanying the letter was an interesting geological section showing the connection and inclination of the lignite beds with reference to the mountain ranges. It is frequently referred to in Mr. Berthoud's letter, but cannot be reproduced in this notice. "Our coal seams extend, to my knowledge, sixty miles due east from Pike's Peak in one direction, south to Raton Mountains and the Raton Pass, and northward to near Denver, on Cherry Creek, and on the west side of the South Platte as far north as near the Cache la Poudre, and to the foot of the main mountain range. Here in Golden City we have a large outcrop of coal, which has been opened successfully, and which inclines toward the mountain next the town. The following sketch, No. 1, will give you an idea of the relative superposition, and the curious succession of the modern deposits in regard to the erupted feldspathic, granitic, talcose, and hornblende rocks of the main mountain range. In one of the newly opened mines on the same outcrop of the Golden City vein, which lies north on Coal Creek about nine miles from Golden City, I saw in 1861 the trunk of a tree taken out of the eleven foot vein, there opened and mined, which trunk, though turned into coal of a good quality, exhibited carbonized bark, knots, and woody fibre, with concentric rings of growth, such as our present dicotyledonous trees plainly show; indeed, one of the miners remarked that from the bark, and the grain or fibre of the coal, it was very much like bitter cottonwood (*Populus angulata*), examples of which grow close to the mine. In 1862, while on a scout east of Pike's Peak sixty-five miles, I found a bed of coal almost identical with the Golden City bed, nine feet thick, lying almost horizontal, with bluffs one and a half miles north, containing fine specimens of belemnites. Again, in November, 1866, I went northeast of Golden City to see the coal beds on Rock Creek, sixteen to nineteen miles distant. I found beds of coal fourteen to eighteen feet in thickness, almost horizontal, or dipping eastwardly at a small angle; above them ferruginous sandstone, and vast beds of bog-iron ore and clay-iron stone in nodules, with numberless fragments of bones. In the sandstone I have obtained fossils like Hippurites. But in none of the beds so far have I found a single marine or freshwater shell, with the exceptions I have before mentioned. Every-

thing that I have so far seen points out that the coal is either cretaceous or tertiary, but I believe it to be tertiary, or of the same age as the coal near Cologne, on the Rhine; but I am perplexed at the inversion of the dip of the coal, sandstone, and the iron ore which here incline toward the mountain instead of away from it, and nothing else that I have observed can compare with these tilted up beds. I have not time now to follow up this subject, nor to give you all the data that I have gathered so far; I shall report to you in full in regard to the points you mention, but will give you as soon as time permits a full report, with elevations, profiles, &c.; also, some specimens to prove the relative age of the strata shown in my sketch."

Mr. Berthoud has forwarded several newspapers published in Colorado Territory, with advertisements of coal for sale at so much per ton at the mines, or so much delivered. It is somewhat strange that since so many practical geologists have travelled over this country for the purpose of examining mines, no definite statement, substantiated by the proper proofs, has ever been placed on record with regard to the age of these coal beds. It only shows that while a man may be a good mineralogist and theoretical geologist, he fails in attempting to work out the structure of a country over large areas.

By permission of the Commissioner of the United States Land Office, at Washington, Dr. Hayden had an opportunity, a few days since, of examining five or six specimens of the brown coal from the Denver Basin, and they have precisely the appearance of the lignite on the Yellowstone and Missouri Rivers, which has long since been shown to be of tertiary age. During the autumn and winter of 1859–60, while connected with the expedition to the head-waters of the Missouri and Yellowstone, under the command of Colonel William F. Raynolds, United States Engineers, Dr. Hayden traced the lignite tertiary formations of the Missouri River to a point near the base of the Laramie Mountains, about eighty miles northwest of Fort Laramie. Here the lignite beds are overlapped and hidden from view by the white marls and clays of the White River Tertiary basin. During the winter Dr. Hayden traced these White River beds along the foot of the mountains southward a short distance beyond Cache la Poudre Creek, but did not observe that the lignite beds reappeared. At Platte Bridge, on the north fork of Platte River, about one hundred and twenty miles northwest of Fort Laramie, a bed of quite pure lignite, four feet thick, is revealed by the river.

During the winter of 1857–58, a company of United States soldiers were stationed at this point, and as wood was very scarce and difficult of access in this region, the soldiers erected temporary grates, and used this lignite for fuel all winter with success.

The following notes in regard to the lignites in this locality, are taken from my journal, recorded on the spot in the winter of 1859–60:

"December 10th, 1859.—Left the bed of the little stream that empties into the Platte River about three or four miles below the Platte Bridge. All of the right side of the Platte River to the foot of the mountains, about eight miles, is covered with cretaceous formation No. 5. The river then makes a bend up towards Richard's Trading Post and Red Buttes. At the Platte Bridge, on the left side of the Platte, the river cuts the bank, giving a vertical section, showing the lignite. The following section is exposed by the river from the water's edge up. The strata have evidently been disturbed, and the cut shows a dip down the Platte eastward of about 5°.

1st. Steel-gray sands, portions quite ferruginous. About eight feet exposed above water at the upper end of the bluffs.

2d. A thin layer of indurated carbonaceous sand, six inches; passing up into an indurated carbonaceous clay, eight inches; passing up into a bluish ash-colored clay, ferruginous, but with comparatively little vegetable matter, twelve inches.

3d. Thirty feet alternate beds of lignite, clays, and marls, the lignite beds varying from two to four feet in thickness, mostly impure, but containing seams four to six inches thick of quite pure lignite, with a shining jet fracture; then above dull yellowish, rust-colored concretions, full of fragments of vegetable matter, as portions of leaves, stems, wood, &c. The clays and marls vary much in color, from a dark brown to a light yellow. At the summit of the cut, near the upper end of the bluff, is a layer of yellow marl, which a few yards down is changed into a yellow laminated calcareous rock, apparently deposited in disturbed waters. Still above are layers of impure lignite and ash-colored clays and marls.

The above gives a pretty good idea of these bluffs as revealed by the river; but in many places near the Platte Bridge the soldiers made excavations and were unsuccessful in their search, finding only an impure material, but in one excavation they found a layer about twelve inches thick, which they appear to have used as fuel successfully. At the most favorable locality I took the measurement with

a tape-line, fourteen inches of lignite, best quality, four and a half feet of indurated carbonaceous clay with numerous irregular local seams of pure coal, like cannel coal. These small seams vary from two inches to two feet in length, and from one-eighth to two inches in thickness. This carbonaceous clay gradually passes up into a light ash-colored indurated clay with some calcareous matter, with oxide of iron, which colors the seams of the fractures on exposure. Thickness, five and a half feet. The layer of pure lignite is underlaid by impure, but I could not tell to what extent, though its character is like that which lies above the pure bed. This pure bed of lignite is underneath the yellow bed before mentioned, and the yellow bed when indurated into compact rock contains impressions of the leaves of a species of *Populus* identical with one so abundant on Tongue River in the lignite clay. There are also a few *Unios* in a friable condition. The lignite burns with a quiet, steady, red flame, gives out a good degree of heat, leaves comparatively little ash, ignites very readily with no breaking in pieces, no snapping, no bitumen. Fragments of turtle shells, and small pieces of a gum-like resin, like the common resin of commerce, were found at this locality. The whole bluff is thirty-five feet high, but taken with the dip of the beds there are probably forty or fifty feet of strata exposed, and only one seam of lignite which is pure enough for fuel."

The lignite of the cretaceous beds, so far as Dr. Hayden has observed it, is entirely worthless for economical purposes. It may be more pure where it is not exposed to the atmosphere. It was first noticed along the Missouri River, near the Omaha Indian reservation, in the sandstones of the Dakota group. It extends about forty miles up the Big Sioux River, never attains a thickness of more than two feet, and is very impure. It is barely possible that by sinking a shaft, that portion which is concealed from the atmosphere may be of some value for fuel. Near Smoky Hill, along the line of the Union Pacific Railroad, the Dakota sandstones again reveal a thin lignite bed. This, too, is very impure, and gives no promise of being useful as fuel. The lignite beds at Raton Mountains are regarded as a continuation southward of those at Denver and vicinity. Prof. J. W. Bailey, as far back as 1848, expressed the opinion that this Raton coal was probably of the age of the "Brora" coal. Since, therefore, we find no well-marked pure beds of lignites in the cretaceous rocks of the West, and throughout the Lignite Tertiary Basin of the Upper Missouri, extending southward nearly to Fort Laramie, and since we

find a large number of beds, some of which are quite pure, and may be used as fuel, it seems very probable that the coal of Denver and vicinity is of tertiary age, and that the formation is a continuation southward of the lignite tertiary beds of the Upper Missouri.

Dr. Le Conte spoke with regard to the lignite of the same region.

Prof. J. P. Lesley was elected Librarian for the ensuing year, and Thomas P. James was requested to continue his administration of the duties of Librarian until the determination of Mr. Lesley with regard to accepting the office be communicated.

The Standing Committees were then appointed as follows:

Finance.—Mr. Fraley, Mr. John F. James, and Mr. Marsh.

Publication.—Mr. T. P. James, Dr. Carson, Prof. Trego, Mr. Price, and Mr. Tilghman.

Hall.—Mr. Peale, Mr. P. E. Chase, and Mr. S. W. Roberts.

Library.—Dr. Bell, Dr. Coates, Mr. Price, Mr. Barnes, and Mr. Briggs.

On motion, the reading of the list of surviving members was postponed until the next meeting.

Pending nominations, Nos. 552 to 554 and 557 to 567, were read, and after discussion the Society proceeded to ballot for the candidates for membership.

All other business having been completed, the ballot boxes were opened, and the following named persons were declared elected:

Ralph Waldo Emerson, Concord, Mass.
Charles Sumner, United States Senator from Mass.
Hon. John Cadwalader, Philadelphia.
Dr. Harrison Allen, Philadelphia.
Andrew Mason, New York.
George F. Dunning, New York.
Dr. B. F. Shumard, St. Louis, Mo.
Dr. J. S. Newberry, Columbia College, New York.
Rev. M. B. Anderson, Rochester, New York.
Prof. Henry Morton, Philadelphia.
Prof. Charles J. Stillé, Philadelphia.

Dr. J. H. Packard, Philadelphia.
Prof. John F. Frazer, Philadelphia.
Rev. Henry S. Osborn, Easton, Penna.

And the Society was adjourned.

Stated Meeting, February 1st, 1867.

Present, seventeen members.

Dr. Wood, President, in the Chair.

Judge Cadwalader, a recently elected member, was presented and took his seat.

Letters were read from Hon. Charles Sumner, dated January 26, 1867, and from Dr. Harrison Allen, January 31, 1867, acknowledging the receipt of notice of their election, and acceptance of membership. Also, from William Procter, Jr., Corresponding Secretary of the Philadelphia College of Pharmacy, dated January 31, announcing the transmission of thirty-seven volumes of the American Journal of Pharmacy; and from the Historical Society of Philadelphia, acknowledging receipt of publications.

On motion of Judge Sharswood, the thanks of the Society was tendered to the College of Pharmacy for so valuable a contribution to the Library; also ordered, that the College of Pharmacy be placed on the list of Corresponding Societies.

Donations to the Library were announced as follows: From the Royal Norwegian University at Christiania; from the Literary and Historical Society of Quebec; from the Public Library of Boston; from the Editors American Journal of Sciences and Arts, and the Franklin Institute; from the New Jersey Historical Society; from the Wisconsin Historical Society, and the College of Pharmacy of Philadelphia.

The death of G. W. Featherstonhaugh, a member, was announced by Thomas P. James, as having occurred September 28, 1866, in his 80th year.

Mr. P. E. Chase made an oral communication on the laws which regulate the transmission and distribution of solar heat.

Prof. Dove, in the discussions by which he demonstrated the existence of consistent and clearly-marked annual barometric tides, has well set forth the importance of broad meteorological generalizations. It is, evidently, only by a comparison of observations made in all quarters of the globe, that we can hope to find the fundamental laws which regulate periodical changes in the atmosphere, and thus become properly qualified for the study of local and exceptional disturbances.

It seems somewhat remarkable, that, in a science so eminently statistical as meteorology, the formidable mass of already accumulated observations has been followed by such meagreness of practical results. Humboldt and Dove have admirably developed the system of isothermal lines, the latter having widely tracked it through its theral, chimenal, monthly, and annual ramifications; but these lines are so largely controlled by ocean currents, mountain ridges, and other local disturbances, that they give us little help towards ascertaining the laws which regulate the distribution of heat over the earth's surface. Mayer believed that the normal mean temperature varies as the square of the cosine of latitude. The error of his formula was soon demonstrated, and I am not aware that any one has proposed a substitute. The active members of the various meteorological societies are industriously engaged in the solution of numerous special problems, and the indefatigable host of observers are evermore adding to the stores of material, but the laborers are too few for the harvest. We are still entirely ignorant of the degrees of influence exerted by the various well-known climatic causes in determining the mean temperature of the several seasons and of the entire year.

The principal elements of general thermometric variation are: 1, the heat imparted by the sun; 2, terrestrial absorption and radiation; 3, atmospheric currents. Of these three agencies, the first is, in one sense at least, the chief, since it is the one on which the others depend; the second is mainly instrumental in modifying the other two, and especially in retarding the daily and yearly changes; the third is a subject of hourly experience, and its meteorological importance is now generally recognized.

The amount of heat which is received directly from the sun, evidently varies as the cosine of the zenith distance, or the sine of the

sun's altitude. In the daily distribution of temperature, this is the most important element, as is evident from the tabular comparisons in my communication of September 21, 1866.* Absorption and radiation proceed at nearly uniform rates, therefore it may be assumed that their effects are approximately proportioned to the time during which they operate. The average general variation which is due to the influence of the winds is a difficult point to determine, but the present investigation has led me to believe that it may be properly measured by the difference of *arc* (instead of the *sine* difference), of the sun's meridian altitude. My reasons for this inference are the following: 1, the general average temperature of the year often appears to vary very nearly as the arc in question, and it seems unreasonable to suppose that a variation of this character can be attributable either to the heat communicated by the sun, or to terrestrial absorption and radiation; 2, the tendency of the air, so far as it is determined by the direct heat of the sun, is at all times towards that point of the earth's surface at which the sun is vertical, and we may readily believe that the thermal effect of the current should be proportional to the distance, measured on a great circle of the earth, through which the air would be obliged to move in order to reach the sub-solar point. This distance evidently varies as the *arc* of the sun's zenith-distance.

We have, then, three natural standards for admeasurement, by means of which, if we rightly eliminate special and limited perturbations, we may perhaps be able to determine the predominating influence, in many cases both of local and of general thermal disturbance. In order to institute as broad a comparison as possible, I have adopted a method of elimination which is substantially the same as the one used in my previous physical investigations, and which may be illustrated by a single example.

The average monthly temperatures of the United States, as deduced from Prof. Coffin's reductions of the "meteorological observations, made under the direction of the United States Patent Office and the Smithsonian Institution, from the year 1854 to 1859 inclusive,"† appear to be as follows:

January, 28.352; February, 30.873; March, 39.049; April,

* *Ante*, pp. 261–269. See especially the observations at St. Bernard, and the general average of Table I, p. 267.

† The reductions referred to, embody the results of more than a million observations, made by nearly a thousand observers, at about eight hundred different stations.

49.744; May, 60.902; June, 69.780; July, 75.640; August, 71.754; September, 65.643; October, 53.922; November, 42.350; December, 32.132. January and July are the months of extreme temperature, terrestrial absorption and radiation retarding the periods of maximum heat and cold so that they fall in the months following the solstices. Averaging the temperatures at equal intervals from January (taking the mean temperature of December and February, of November and March, &c.), we get the following results:

Months, from Jan., . .	0	1	2	3	4	5	6
Average Temp., .	28.352	31.502	40.699	51.833	63.272	70.767	75.640
Monthly Diff., . .	. .	3.150	12.347	23.481	34.920	42.415	47.288
Ratio of do. . .	. .	.067	.261	.497	.738	.897	1.000
Ratio of Difference of Zenith distance,	. .	.069	.255	.500	.745	.931	1.000

The second of the above series of ratios (that of the difference in the arc of the sun's zenith distance), is based upon the following estimate of the average monthly increase of solar altitude, at all places in the temperate zones:

Mo., from winter solstice, . .	1	2	3	4	5	6
Increase of sol. altitude,	3°½	12°	23°½	35°	43°½	47°
Ratio of increase, . . .	.069	.255	.500	.745	.931	1.000

If we allow about twenty-four days for the cumulative effects of increasing heat and cold, these ratios become properly comparable with the monthly ratios of temperature-variation.

The data for the following table, with the exceptions specified in the foot-notes, were drawn from Herr Dove's sixth paper, "Über die nicht periodischen Veränderungen der Temperatur-Vertheilung auf der Oberfläche der Erde" (Memoirs of the Berlin Academy of Sciences, for 1858), and from his local corrections for periodic and non-periodic variations, as inserted by Prof. Guyot, in the V. series of "Tables, Meteorological and Physical, prepared for the Smithsonian Institution," third edition. In determining the general ratios, all observations for incomplete years were discarded, and in some instances, where the stations involved were very numerous, I also

omitted such records as extended over a period less than from three to five years. The comparison is confined to the extra-tropical regions, because the double maxima in the torrid zone would have complicated the results too much for my present purpose. The differences are counted from January in the Northern, and from July in the Southern hemisphere. The first series of ratios for the Northern hemisphere is computed from the monthly averages at 217 stations, recorded in Dove's V. table, "Abweichungen, 1845–1855, bezogen auf Mittel längerer Reihen." At 206 of the stations the observations covered periods of from ten to seventy-seven years, the general average period of the entire table being upwards of twenty-two years. The second series is obtained by combining the more limited ratios of the several countries, a method which gives undue weight to the European observations. The third series is based on the respective European, Asiatic, and North American averages, allowing to each grand division a weight corresponding to the portion of its area which is embraced in the temperate zone. The ratios of the Southern hemisphere (where the stations are few in number, and confined to the sea-coast), are calculated by the first method.

General and Local Ratios of Monthly Temperature-Differences.

Difference of Time, months, . .	1	2	3	4	5	6
Ratios of sines, ...	.076	.284	.545	.784	.946	1.
" " arcs, . . .	.069	.255	.500	.745	.931	1.
N. Hemisphere, series I, .	.076	.259	.512	.755	.935	1.
" " II, .	.064	.225	.499	.729	.935	1.
" " III, .	.079	.270	.517	.755	.929	1.
S. Hemisphere, . . .	.077	.281	.538	.763	.938	1.
Arctic Regions, . . .	.071	.231	.479	.733	.934	1.
Europe, ...	.069	.239	.501	.738	.938	1.
Asia, ...	.097	.274	.535	.769	.934	1.
N. America, . . .	.055	.279	.494	.741	.917	1.
S. America, . . .	.077	.275	.501	.724	.936	1.
Africa, ...	.088	.267	.537	.761	.938	1.
Australia, ...	.081	.313	.618	.801	.913	1.
United States,[a] . . .	.054	.256	.500	.743	.904	1.
Russian Empire, . .	.097	.262	.512	.758	.935	1.
Siberia, ...	.099	.265	.543	.763	.938	1.
Russia, ...	.076	.258	.506	.749	.935	1.
Scandinavia, . . .	.057	.183	.430	.675	.904	1.

[a] Mean of Dove, Coffin, and Guyot.

GENERAL AND LOCAL RATIOS, &c.—*Continued.*

Difference of Time, months, . .	1	2	3	4	5	6
G. Britain and Ireland, .	.068	.205	.445	.720	.939	1.
Holland, ...	.108	.149	.479	.721	.947	1.
France, ...	.073	.210	.507	.705	.935	1.
Spain and Portugal, . .	.042	.216	.470	.682	.928	1.
Italy, ...	.041	.231	.511	.691	.919	1.
Mediterranean Coast, .	.079	.269	.505	.735	.952	1.
Austria, ...	.066	.234	.541	.762	.951	1.
Prussia, ...	.096	.216	.520	.753	.955	1.
Wurtemburg, . . .	.025	.215	.489	.750	.935	1.
Germany, ...	.088	.241	.541	.777	.982	1.
Switzerland, . . .	.071	.226	.524	.727	.951	1.
N. Africa, ...	.095	.267	.526	.726	.888	1.
S. Africa, ...	.082	.268	.548	.797	.988	1.
New Zealand,[b] . . .	.026	.201	.434	.829	.895	1.
Washington, . . .	.063	.259	.516	.751	.925	1.
Philadelphia, . . .	.031	.231	.471	.733	.926	1.
Toronto,[c]	.085	.259	.517	.727	.927	1.
New Haven,[d] . . .	.059	.256	.498	.740	.932	1.
Albany,[e]	.057	.261	.511	.761	.936	1.
Salem, Mass.,[f] . . .	.077	.260	.495	.734	.924	1.
Godthaab, ...	.089	.216	.458	.732	.934	1.
Sitka, ...	.148	.252	.497	.729	.953	1.
Tiflis, ...	.134	.279	.567	.751	.928	1.
Pekin, ...	.054	.249	.532	.778	.927	1.
Nertchinsk, . . .	.065	.308	.587	.808	.942	1.
Barnaul, ...	.049	.263	.552	.753	.940	1.
Venice, ...	.099	.275	.531	.736	.945	1.
Palermo, ...	.054	.197	.424	.685	.906	1.
Milan, ...	.105	.302	.537	.770	.936	1.
Gibraltar, ...	.074	.232	.513	.704	.890	1.
Geneva, ...	.097	.274	.514	.771	.943	1.
St. Bernard, . . .	.154	.262	.483	.755	.932	1.
Vienna, ...	.094	.271	.534	.790	.951	1.
Ratisbon, ...	.117	.293	.564	.823	.959	1.
Stuttgard, ...	.138	.297	.536	.784	.941	1.
Carlsruhe, ...	.114	.278	.531	.793	.945	1.
Munich, ...	.092	.209	.511	.729	.948	1.
Berlin, ...	.106	.250	.508	.777	.946	1.
Prague, ...	.112	.248	.536	.754	.947	1.
Paris, ...	.120	.286	.515	.784	.946	1.
Brussels, ...	.125	.275	.528	.780	.973	1.
Zwanenburg, . . .	.128	.259	.517	.787	.948	1.
London, ...	.120	.242	.481	.747	.936	1.
Dublin, ...	.086	.173	.370	.722	.953	1.
Kinfaun's Castle, . .	.108	.234	.445	.706	.917	1.
Copenhagen, . . .	.073	.200	.462	.742	.944	1.
Tornea, ...	.079	.227	.464	.690	.908	1.
Catharinenburg, . .	.007	.266	.518	.748	.912	1.
St. Petersburg, . . .	.082	.230	.471	.714	.924	1.
Moscow, ...	.107	.248	.505	.758	.942	1.
Odessa, ...	.087	.282	.518	.735	.925	1.
Cairo, ...	.043	.273	.544	.755	.971	1.
Capetown, ...	.050	.222	.524	.755	.967	1.
Melbourne, . . .	.094	.335	.519	.774	.938	1.
Rio Janeiro, . . .	.065	.234	.600	.749	.937	1.
Valparaiso, . . .	.076	.244	.456	.716	.940	1.

[b] One year's observations at Auckland.
[c] Lefroy.
[d] Loomis and Newton, 86 years.
[e] Guyot, 19 years.
[f] Guyot, 42 years.

The averages at individual stations often present considerable variations, even when different decades, or longer periods, are compared. It is, therefore, uncertain to what extent the laws of limited local change are manifested by this table, but in the extended groupings of countries, divisions, continents, and hemispheres, I think the indications of the ratios can be safely trusted.

By taking the differences from month to month (instead of the aggregate increase from the winter solstice), we may form some idea of the change at different periods of the year, in the relative climatic influence of the sun and the winds. The method of comparison may be readily understood by referring to the following table. The small figures denote the ratio (^{1} of sines, or ^{2} of arcs) to which the increment most nearly approximates. The sums of the monthly differences give the aggregate ratios of the preceding table. The first series of means is derived directly from the tabular numbers, by allowing equal weight to each; the second allows to each ratio a weight corresponding to the territorial area.

Monthly Ratios of Change in Sine, Arc, and Temperature.

Months, ...	1st.	1st to 2d.	2d to 3d.	3d to 4th.	4th to 5th	5th to 6th.
Sines,*	76	208	261	239	162	54
Arcs, ...	69	186	245	245	186	69
Temperature. Europe, . . .	69^2	170^2	262^1	237^1	200^2	62^2
Asia, . . .	97^1	177^2	261^1	234^1	165^1	66^2
N. America, . .	55^2	224^1	215^2	247^2	176^2	83^2
S. America, . .	77^1	198^1	226^2	223^2	212^2	64^2
Africa, . . .	88^1	179^2	270^1	224^1	177^2	62^2
Australia, . . .	81^1	232^1	305^1	183^1	112^1	87^2
I. Mean, . . .	78^1	197^2	256^1	225^1	175^2	71^2
II. Mean, . . .	82^1	191^2	254^1	229^1	175^2	69^2

These comparisons seem to warrant the following inferences, all of which are confirmed by a more extended and minute examination, as well as by other considerations.

1. Taking into view the entire land surface of the globe and the entire range of the year, the direct heat of the sun, and the induced aerial currents appear to be about equally instrumental in determining fluctuations of temperature.

* The sines employed in each table are merely the sines of the excess of meridian altitude above the minimum, and not the increment of the sine of least meridian altitude. If the latter had been used the number of ratios approximating most nearly to the differences of arc would have been much greater.

2. The influence of the winds is most marked in the Northern and Western hemispheres; that of solar obliquity in the Southern and Eastern hemispheres.

3. Where the sun's rays are least intense (as in the Polar Regions), and where the winds are most variable, the ratios exhibit the nearest parallelism to the increments of arc; but where the winds are most uniform (in and near the region of monsoons) they correspond more closely with the sinal increments.

4. The general changes of temperature at midwinter, and at the equinoctial seasons (when the sun's declination is changing most rapidly), are most dependent upon the local solar heat; the midsummer changes are more subject to the influence of the winds.

5. The greatest conflict of opposing forces occurs during the sun's passage between the comparatively wind-governed Northern hemisphere and the sun-governed Southern hemisphere. The conflict is manifested in the spring and autumn rains.

6. The closest and most general approximation of ratios is shown in the monthly temperature-change at midsummer, which (in the II. mean), corresponds precisely with the change of arc.

Dr. Hayden spoke of the geographical distribution of plants, and referred to a number of species which are considered as exotics in this part of our country, but indigenous in regions west of the Mississippi.

Dr. Hayden said that the reading of a remarkable volume, recently published in England, had suggested some remarks in regard to the geographical distribution of the Flora and Fauna of the country west of the Mississippi. The book referred to is entitled the "Geographical Distribution of Mammals," by Andrew Murray. He had noticed a few plants in the Valley of the Missouri, which are undoubtedly indigenous there, but they have always been, and are regarded now as introduced east of the Mississippi.

1. *Portulacca oleracea:* Nuttall, in his genera of North American plants, says, "Indigenous on the saline and denudated plains of the Missouri, a plant common to every part of the globe." Gray, "Common in cultivated and waste grounds, naturalized from Europe." Dr. Darlington, "Undoubtedly an introduced plant here." Dr. Gray, in one of his later works, says, it is undoubtedly wild in Arkansas and Texas. Dr. Torrey says, that in the Atlantic States it

is undoubtedly a naturalized plant. Dr. Hayden has seen it in many localities in the Upper Missouri, where it could not have been otherwise than indigenous. It occurs in barren and saline places, in soil composed mostly of the clays of the Fort Pierre group, No. 4, cretaceous. It grows sparingly near the mouth of the Teton River, about four miles below Fort Pierre, in the Valley of White River, near the "Mauvaises Terres," in the Valley of the Niobrara River, near the mouth of Rapid River. It also grows quite abundantly on and around the rock exposures of the red quartzites of Dakota, in the Valley of James River, Vermilion, at Sioux Falls, and the Red Pipestone quarry. It does not grow as abundantly or as luxuriantly in any of these localities, as in our gardens and cultivated grounds.

2. *Achillea millefolium*, regarded by Dr. Darlington and Elliott as naturalized from Europe. Dr. Hooker (Flora Boreali Americana), says, "This plant is distributed throughout the British possessions, from Lake Huron to the Arctic Sea, and from the Atlantic to the Pacific Ocean." In the Northwest it is variable, sometimes with short woolly leaves, and at other times long lower ones, a foot long and three inches in diameter. On account of its more woolly character, it has been called *A. lanosum* by Nuttall, but Dr. Torrey does not recognize it as distinct. Beck, in his "Botany of the Northern States," 1848, says, "It is introduced and extensively naturalized from Arctic America to Oregon and Mexico." He does not consider it indigenous. It was found by Stansbury in the islands of Salt Lake. (Report, page 391.) Dr. Torrey, in "Marcy's Report," states that it is found on the upper tributaries of the Red River. It is the woolly form that occurs almost exclusively west of the Mississippi. It is found distributed almost universally over the broad grassy plains of the Upper Missouri. It does not grow in masses or thick bunches, as about houses and cultivated places east of the Mississippi, but usually with a single stalk, or at most four or five from one root. It would seem to be, without doubt, indigenous in the West.

3. *Humulus lupulus*.—"This plant, though cultivated (*i. e.*, the pistillate one) in almost every garden, is undoubtedly indigenous along our streams. The pistillate plant, in cultivation, being usually remote from the staminate, I think the ovaries are commonly abortive." (Flora Cestrica, page 287.)

Nuttall, in "Memoirs of the Academy of Natural Sciences," 2d series, page 181, calls it *H. Americanus*, and says, "I have ven-

tured, I think, on sufficient grounds to separate the American from the European species. Found as it is in the uncultivated interior of the continent, beyond the reach of inhabitants, our plant must necessarily be indigenous. I have compared the present with the foreign plant with some attention, and can in all cases readily distinguish them by their foliage. In the American plant, whatever be the other variations of the leaf, the attenuated points are toothed nearly to the extremity. In the European, the summit of the leaf is abruptly toothed. In the mature plant, the male flowers appear to be smaller, and the scales of the cones are likewise acuminate. In some specimens, as in the European plant, the upper leaves are simply cordate and entire, but in all cases the denticulations are smaller and more numerous." Dr. Gambel found the hop in the Rocky Mountains, on the line of Mexico, growing most luxuriantly. From the various reports of travellers, it seems to be widely distributed throughout the country west of the Mississippi. In the broad bottoms of the Valley of the Missouri River, it grows in the greatest luxuriance twining upon the largest trees, and producing its ament-like fruit in the greatest quantities. It is found in almost every ravine and valley of a stream from the foot of the mountains to the Mississippi. A brewer at the mouth of the Niobrara, Dakota Territory, has attempted to utilize it with some success.

4. *Plantago major*, is considered in the Flora Cestrica as truly a foreigner, a naturalized foreigner, remarkable for accompanying civilized man, growing along his footpaths, and flourishing around his settlements. Introduced from Europe according to Beck. Dr. Richardson finds it from Lake Huron to latitude 68°. It has also been found in Newfoundland and Labrador. De Schweinitz says, there is no place where it is not introduced. Along the Missouri River, about the trading-posts, and along some of the principal thoroughfares of the West, this plant is occasionally seen, but seldom or never observed in the interior remote from the haunts of men. It was observed in 1859 on the wooded bottoms of the Missouri River, between Fort Clark and Fort Pierre, at least two hundred miles from any human habitation, under circumstances such as to lead one to suspect that it might be indigenous, but it is hardly probable.

The climate of the Upper Missouri district is somewhat peculiar. There seems to be what may be called two seasons, a wet and a dry season. The wet season usually commences about the middle of March, and continues until the middle of May. During this period the rains are frequent and severe, sometimes continuing for thirty

days in succession. The dry season commences about the middle of July, and usually continues through the autumn and sometimes a portion of the winter. Occasionally heavy storms of short duration occur in September and October, but usually the weather is delightful, the sky being sometimes for weeks with scarcely a cloud. Probably three-fourths of the plants of the country are in blossom during the months of May and June and the first half of July. During the month of September the ground becomes parched by drought, and very little vegetation clothes the prairies, and everything presents the appearance of desolation; very few flowers are in bloom, except now and then a composite plant. The greater portion of the Upper Missouri flora belongs to the great families of *Cruciferæ*, *Leguminosæ*, *Compositæ*, *Chenopodiaceæ*, and *Gramineæ*. The Cryptogamic plants are rare. Between Council Bluffs and the foot of the Rocky Mountains, there are very few ferns, mosses, lichenes, or fungi, throughout what is called the prairie region. There are very few trees to be seen except those which skirt the streams, and these are mostly a species of cottonwood, *Populus angulata*. In the limestone district of the State of Missouri, the sugar maple, *Acer saccharinum*, occurs in great abundance, and disappears in Kansas. The *Acer rubrum* continues to the mountains more or less rare. On the Vermilion and Big Sioux Rivers this tree is abundant, and the Indians have made sugar from its sap. Most of the species of oak and the hickory cease in latitude 42½°. At the mouth of the Big Sioux, *Tilia Americana*, *Gymnocladus Canadensis*, *Ulmus fulva*, *Juglans nigra*, *J. cinerea*, *Celtis occidentalis*, *Gleditschia triacanthos*, occur in small quantities; and in ascending the Missouri, these trees begin to disappear, and entirely cease before reaching the mouth of White River. About one hundred miles above Council Bluffs, the last sycamore, *Platanus occidentalis*, is seen along the Missouri. It has not been observed west of that point. *Negundo aceroides Fraxinus Americana*, *Quercus macrocarpa*, two species of *Juniperus*, and certain under shrubs, as *Xanthoxylum Americanum*, *Staphylea trifoliata*, *Euonymus atropurpureus*, *Symphoricarpus vulgaris*, *Cornus sericea*, *C. stolonifera*, several species of *Vitis*, *Ribes*, *Rhus*, *Rosa*, and *Salix*, are found more or less abundant to the foot of the mountains, especially along the bottoms of the Missouri or Yellowstone. Among the shrubs bearing palatable fruit, are *Shepherdia argentea*, *Amelanchier Canadensis*, and *Prunus Virginiana*, which are universally distributed, and of great value to the wandering Indians.

Much might be said in regard to the geographical distribution of

the quadrupeds and birds of the Upper Missouri, but a few species only will be mentioned in this connection. On the prairies of Illinois, Indiana, and Iowa, the prairie hen or ruffed grouse, *Cupidonia Cupido*, is very abundant, but in ascending the Missouri River, this species gradually disappears near the mouth of the Niobrara River, and is replaced by the sharp-tailed grouse, *Pediocees phasianellus*, which continues thence to the foot of the mountains. Although the wild turkey is abundant within the limits of the settled portions of the West, it has never been seen above the mouth of White River. The quail, *Ortyx Virginiana*, is not known to occur above the mouth of the Niobrara.

The Western fox-squirrel, *Sciurus Ludovicianus*, is quite abundant about Council Bluffs, but gradually becomes rarer toward the West, until it ceases to appear near the mouth of the White River, in latitude 43¼°; longitude 99½°. The gray and black squirrel, *S. Caroliniensis*, is common at Leavenworth City, Kansas, has been seen as far up the Missouri as the mouth of the Platte, but has never been observed farther westward. The raccoon, *Procyonlotor*, is quite abundant as far westward as Big Sioux River, where a considerable trade is carried on between the whites and Indians in their skins. None have been observed west of White River. The white-tailed or wood deer, *Cervus leucurus*, is very abundant on the wooded bottoms of the Missouri, from the mouth of the Kansas to the Big Sioux, and not rare from thence to the mountains, but it is confined to the wooded valleys of streams. On the other hand, the black-tailed or mule-deer, *C. macrotis*, is rarely seen below Fort Pierre, and its favorite haunts seem to be among the rugged and interminable ravines and cañons of the streams in the "bad-lands" and along the foot hills of the mountains. It will be seen at a glance from the few observations here made, that most animals and plants are restricted by nature within certain geographical limits. The beautiful species of rabbit, *Lepus Bairdi*, n. s., which was collected by Dr. Hayden for the first time in the spring of 1860, on the summit of Wind River Mountains, seems peculiarly adapted to dwell in these regions of perpetual snow. Its long toes, having very flexible joints, and covered with long thick hair, enables it to travel with ease over the snow, leaving behind it a track altogether out of proportion in extent, to the size of the animal. Its geographical limits are not yet well known, but it would appear to be restricted to the snow-covered summits of the mountains.

Dr. Hayden stated that he had made these remarks simply to

show the rich field of study the West opened up in the geographical distribution of its Fauna and Flora. There are also natural reasons why certain species of animals and plants are restricted to certain geographical areas, and it is his purpose to commence the accumulation of materials towards a memoir on the geographical distribution of the Fauna and Flora west of the Mississippi.

He also exhibited a photograph of matting from New Iberia, Louisiana; this matting was found in the deposits of salt near that place, which he described.

He then referred to the importance of the lignite beds of the Upper Missouri, and the value of this article as a fuel in a region where timber is rarely to be found.

New nomination No. 568 was read.

The list of surviving members was read, comprising the number, on the 1st January, 1867, of 410, of whom 262 were in the United States, and 148 in foreign countries.

No. 76 of the Proceedings of the Society was laid on the table.

And the Society was adjourned.

Stated Meeting, February 15, 1867.

Present, sixteen members.

Prof. CRESSON, Vice-President, in the Chair.

Prof. Stillé and Dr. Packard, recently elected members, were introduced and took their seats.

Letters were read from J. S. Newberry, dated February 6, 1867; from George P. Dunning, February 8, 1867; Andrew Mason, dated February 8, 1867; and H. S. Osborn, February 12, 1867, severally acknowledging the receipt of the notice of their election as members and of their acceptance. And from the Physical and Natural History Society at Geneva, October 15; from the Geological Society of Glasgow, November 19; from the Bavarian Academy of Sciences, December 1, announcing donations to the Library. Also, from

the Royal Danish Society of Sciences at Copenhagen, March 31 and September 27; from the Royal Society of Edinburgh, December 4; from the Academy of Sciences at Chicago, February 1st; from the Historical Society of Pennsylvania; from the Essex Institute, Salem, February 13; from the New York Historical Society, severally acknowledging the receipt of publications of the Society.

A letter from T. Morris Perot, President of the Mercantile Library, was read.

Donations to the Library were announced as follows: From the Royal Society of Victoria at Melbourne; from the Royal Danish Astronomical Society at Copenhagen; from the Upper Lausatian Society of Sciences at Görlitz; from the Royal Prussian Academy at Berlin; from the Zoological Garden at Frankfort au Main; from the Society of Natural History at Strasburg; from the Munich Observatory; from the Royal Bavarian Academy at Munich; from the Physical and Natural History Society at Geneva; from the Geographical Society at Paris; from the Geological Society at Glasgow; from the Royal Society of Edinburgh; from the Leeds Philosophical and Literary Society; from Henry Denny; from the Society of Arts and of the Institutions in Union at London; from the Royal Geographical Society of London; from Messrs. La Rue, Stewart & Loewy, London; from A. H. Worthen of the Geological Survey of Illinois; from the New Jersey Historical Society; from the Water Department of this city; from Dr. Hayden; from the Franklin Institute; from the Academy of Natural Sciences of Philadelphia; from the publishers of the Medical News and Library.

Dr. Hayden introduced the subject of photographic representations of the Indian aborigines, resident in the regions west of the Mississippi, and recommended the preservation of photographs of persons and scenery from that part of the country in albums of the Society.

The proceedings of the Board of Officers and Council at their last meeting were read.

The subject of an exchange of publications with the Geo-

logical Society of Glasgow, was referred to the Secretaries, and to report.

It was ordered that the Transactions, new series, be presented to the Library of the College of Pharmacy.

The following resolution, offered by Dr. Hayden, was adopted:

Resolved, That a committee of three be appointed to procure photographic portraits of North American Indians for ethnological purposes, and that an appropriation of fifty dollars be now made to carry the object into effect.

The following named gentlemen were appointed: Dr. Hayden, Dr. Wilcocks, and Mr. Peale.

Dr. Hayden spoke of the great scarcity of timber in certain parts of the country about the upper waters of the Missouri, and suggested the entire practicability of supplying the country below with timber floated from the Black Hills down the Sheyenne to the Missouri, and alluded to the resources which were destined to exercise a great influence on the future advancement of that region.

Between the Mississippi and the eastern slope of the Rocky Mountains, the greater part of the land is properly entitled to the appellation of prairie country. After passing westward of longitude 95°, the timber becomes very scarce, until very little is seen except that which skirts the streams. It is safe to say that not more than one acre in fifty thousand is occupied by good forest trees, over and comprising a belt or zone of five hundred miles in width, extending from latitude 49° to New Mexico. Inasmuch as the geological formations which underlie that region are for the most part of the Mezoic and Cenozoic ages, no very valuable beds of coal need be looked for. It is true that the lignite beds of one of the great tertiary may supply a considerable amount of fuel, yet that supply will be somewhat uncertain in its character. It becomes therefore a question of great importance to the Western settlers, who are pushing westward very rapidly and taking possession of those fertile lands, where they will get their supply of timber for building and other economical purposes. The Black Hills, which form a part of Southwestern Dakota, are at this time attracting a great deal of attention, and

seem to present one of the most important fields of enterprise in the West.

All of Dakota is most excellent for grazing and much of it for agricultural purposes, but its great deficiency is its want of a proper supply of timber for fuel and for building purposes. It therefore becomes a question of absorbing interest to the settlers how this defect can be remedied. I will attempt to explain this point as clearly as possible, and the facts which I present have been obtained by years of exploration in these Western regions before Dakota was organized as a territory. If any one will examine my report and scientific papers, published from time to time since 1850, he will find that I have always earnestly advocated the industrial interests of the great Northwest, though my attention was so absorbed in the grand scientific results that I could never foresee the marvellous progress which has already been made.

The Black Hills form the most eastern outlier of the main chain of the Rocky Mountains, and would appear to be an independent elevation were it not for a low anticlinal which extends across the plain country southward, connecting them with the Laramie range. Very little was known of those hills until they were explored in the summer of 1857 by a United States Expedition, under the command of General G. K. Warren, U. S. A., to which expedition I had the honor of being attached, as geologist and naturalist. A preliminary report of the results of this exploration was presented to the War Department by General Warren in 1859, and published by Congress under the title of "Explorations in Nebraska and Dakota, in the years 1855–6 and 7."

The Black Hills lie between the 43d and 45th degrees of latitude, and the 103d and 105th meridians of longitude, and occupy an area about one hundred miles in length, and about sixty in breadth, or about six thousand square miles. The shape of the mass is elliptical, and the major axis tends about 20° west of north. The base of these hills is about two thousand five hundred to three thousand feet, and the highest peaks six thousand seven hundred feet above the ocean. The whole range is clasped, as it were, by the north and south forks of the Big Sheyenne River, the most important stream in this region. The north branch passes along the north side of the range, receiving very many of its tributaries, and most of its waters from it, but takes its rise far to the westward of the range near the sources of Powder River, in the divide between the waters of the Yellowstone and those of the Missouri.

The south fork also rises in the same divide, flowing along the southern base of this range, and also receives numerous tributaries which have their sources in it. These two main branches unite about thirty miles east of the Black Hills, forming the Big Sheyenne, which empties into the Missouri about sixty miles above Fort Pierre. The Moreau, Grand, Cannon-ball, and other rivers, flowing into the Missouri, north of the Sheyenne and south of the Yellowstone, rise in a high tertiary divide north of the Black Hills, and are for the greater part of the season quite shallow, and sometimes nearly dry; but the Little Missouri derives a portion of its waters from the Black Hills, through a number of small branches which flow from the northwestern slope. We thus see that the Black Hills do not give rise to any important stream, if we except the Little Missouri, a few branches of which flow from springs near the base of the hills; but supply a comparatively small quantity of water from that source. The Sheyenne is fed, the most part, from the numerous small streams which issue from copious springs in the more elevated portions. It would seem, therefore, that the Black Hills do not have a marked influence on the drainage of the West.

As I have before remarked, the Black Hills occupy an area of about six thousand square miles. I regard it as within bounds to say that at least one-third of this area is covered with a fine growth of good pine timber. You can see, therefore, that within the limits of the Territory of Dakota, you have 1,280,000 acres of as good pine lumber as can be found in all the Western country. This timber is of a fine healthy growth, from two to four feet in diameter at the base, and often ascending eighty feet without a limb.

The question in regard to the quantity of pine timber in the Black Hills being settled, the next point of importance is to determine upon a plan to transport it to the settled portions of the Territory. I think that the future will show that there are no obstacles in that direction that can resist the will of the Dakotians. Allow me to quote from a report to General Warren, dated March 15th, 1856, when I used the following language: "The Black Hills, which appear in the distance, and derive their name from their dark and gloomy appearance, contain an inexhaustible quantity of the finest timber, mostly pine, which will doubtless remain undisturbed for many years to come. I will, however, propose a plan for obtaining this timber, and rendering it useful to future settlers, though I do it with some hesitation, lest it may seem visionary. The left fork of the Sheyenne passes through the northern portion of the Black Hills, and, even there, is a consid-

erable stream, from thirty to fifty yards wide. In the spring the river is much swollen, and the current exceedingly rapid, and the timber, if cut and hauled to the banks of the river, might be floated down into the Missouri with considerable safety and ease."

When I wrote the above paragraph, I did not foresee that this Western country would be so soon settled almost within sight of the Black Hills. When I ascended the Missouri for the first time in 1853, Kansas was a wild Indian Territory and Government agents driving from it all white men who might be attempting to gain a foothold there. Now Kansas is a State, Nebraska has just become one, and Colorado is knocking loudly at the door, and must soon be admitted. Then will follow in quick succession, Dakota, Montana, and Idaho. Since 1853, I have explored with more or less minuteness, the Territories of Kansas, Nebraska, Dakota, Montana, Idaho, and Colorado, and I need hardly say that I have watched with the deepest interest every step in the progress of their advancement.

Some objection might arise in regard to the climate and the fertility of the soil in the vicinity of the Black Hills. I would reply that on the 9th of March, 1855, I gathered flowers on the foot-hills of the mountains, and the green grass was springing up everywhere, and the antelopes were sunning themselves in flocks upon the hillsides. Spring had fairly come. For a considerable distance either way from the mountains, the soil is quite fertile, and would, in my opinion, be adapted to the cultivation of any of the cereals which are raised in our Western States.

The next question that arises, pertains to the mineral resources of the Black Hills. I will not speak of their geological structure in detail at this time, but reserve that for a future period. The gold and most of the valuable minerals along the eastern slope of the Rocky Mountains, are found in the metamorphic, or as they are sometimes called the azoic (destitute of organic life) rocks, that is crystalline, limestones, slates, quartz beds, &c. These rocks occur around the Black Hills with a thickness of one thousand to two thousand feet. To what extent the precious metals will be found in these rocks I will not attempt to foretell. My facilities for examinination were very poor, and only a superficial one could be made; but enough was determined to show that gold and silver occurs in greater or less quantities, and that all the other minerals occur in abundance. Gypsum is found in beds from ten to fifty feet in thickness—beautiful snowy gypsum.

The nucleus of the Black Hills is formed by red feldspathic gran-

ite, surrounded with a belt of metamorphic azoic rocks. Resting unconformably upon them are a series of sedimentary beds inclining at various angles from either side of the granitic nucleus. Resting unconformably upon the azoic beds is the Potsdam sandstone with its characteristic fossils. This is the only member of the Silurian age represented in the Rocky Mountains. Next comes the limestones of the Upper Coal Measures, then the red beds of the Triassic, the Jurassic marls, cretaceous clays, and beds of both basins of the Tertiary Lignite and White Rivers. The evidence is clear that all these beds once extended uninterruptedly in a horizontal position over the area now occupied by the Black Hills.

And the Society was adjourned.

Special Meeting, February 19, 1867.

Present, twenty members.

Dr. Wood, President, in the Chair.

The President stated that intelligence of the death of Professor Alexander Dallas Bache, on the 15th inst., had been received, and that he had convened this meeting for the purpose of taking such measures as might be deemed proper for the loss of so distinguished an associate, and to tender the use of the hall to the committee appointed by a meeting of the scientific, learned, and other bodies of the city, held at the Chapel of the University of Pennsylvania this day.

Mr. Fraley then reported to the Society the proceedings of said meeting, and gave a feeling and appropriate sketch of the life, character, and services of Prof. Bache, and offered the following resolutions, which were adopted:

Resolved, That a committee be appointed to prepare appropriate resolutions, expressive of the regret and sorrow of the Society at the loss it has sustained by the death of Alexander Dallas Bache.

Resolved, That the hall of the Society be placed at the disposal of the committee, this day appointed at a meeting held by the mem-

bers of the learned Societies and other bodies, for the reception and care of the remains of Prof. Bache, while they remain in this city.

Resolved, That the chair of the presiding officer, and the hall of the Society, be draped in mourning for the space of six months.

Resolved, That a committee of three be appointed to co-operate with the committee above named, in arranging for the reception and proper care of the body of Prof. Bache while it remains in the hall of the Society, and for making any arrangements for any funeral procession, if such should be deemed proper.

The committee appointed under the first resolution consisted of Mr. Fraley, Mr. Fisher, and Mr. Peale.

The committee appointed under the last resolution consisted of Mr. Cuyler, Mr. Price, and Mr. T. P. James.

And the Society was adjourned.

Stated Meeting, March 1, 1867.

Present, fifteen members.

Judge SHARSWOOD, Vice-President, in the Chair.

Dr. Harrison Allen, a recently elected member, was introduced and took his seat.

Letters were read from Dr. B. F. Shumard, dated St. Louis, February 20, 1867, acknowledging the receipt of notice of his election and of his acceptance of membership in the Society; also from the Academy of Sciences of Chicago, dated February 14; and from the Corporation of Yale College, February 16, each acknowledging the receipt of the Proceedings.

Donations to the Library were announced as follows: From the Imperial Society of Agriculture, &c., at Lille; from the Geographical Society at Paris; from the Royal Astronomical Society, London; from Dr. Jacob Bigelow, Boston; from the California Academy of Natural Sciences; from Dr. I. I. Hayes; from the Franklin Institute; and from P. W. Sheafer.

Mr. Fraley announced the death of Prof. Alexander Dal-

las Bache, which occurred on the 17th of February, 1867, in the 61st year of his age, and reported, on behalf of the committee appointed at the special meeting of the 19th ultimo, the following resolutions, which were adopted:

Resolved, That by the death of Alexander Dallas Bache, the American Philosophical Society has lost a member distinguished for his zeal in, and devotion to, the cause of Science, and for the excellency of his private life and character.

Resolved, That the reputation won by Professor Bache in the cause of education, and in extending the whole realms of science and useful knowledge is a source of honorable gratification to his friends and associates, and is to be most highly prized as a matter of national pride, and as placing our country, in these respects, on an equality with any other in the world.

Resolved, That the termination of the life of such a man is deeply to be mourned, for it rarely happens that so much mental strength and such stores of knowledge are combined with such winning manners, such delicate and profound discrimination in the choice of men and places, and such great executive ability in accomplishing results and awarding to every colaborer his full measure of appreciation and honor.

Resolved, That this Society, connected as it has been with him from his early manhood until his death, and having had the benefit of his services and counsel in an eminent degree during nearly the whole of that period, is especially called upon to deplore his loss, and to perpetuate on its records the memory of one so wise and good, and to keep him constantly in remembrance as an example worthy of general imitation.

Resolved, That a member be appointed to prepare an obituary notice of Professor Bache for publication in the Proceedings of the Society.

Resolved, That the officers of the Society be requested to forward a copy of these proceedings, and of those of the 19th ultimo, to the widow of Professor Bache, and to express our cordial sympathy with her in the great bereavement with which she has been visited.

On motion of Prof. Frazer, Mr. Fraley was appointed to prepare the obituary notice.

Mr. Marsh read from a letter of Mr. A. S. Herschel, a very interesting notice of an examination of the spectra of

meteors, made on the 10th of August, and the 14th of November last.

Mr. Chase made some remarks on the same subject.

Mr. Cresson called the attention of members to the remarkable rise of the barometer on the 10th and 11th of February, the highest point reached on the 11th A. M., being 31″20.

He considered this great synclinal wave to be the indication of the approach of a northeast storm of unusual magnitude. Such a storm in fact set in within thirty hours after the maximum barometer rise, and it has prevailed to the present time, say for seventeen days, and does not appear to be yet ended, as the barometer remains above the mean level and easterly winds prevail.

The storm is of unusual extent, commencing west of the Rocky Mountains, and reaching nearly all latitudes in the United States.

Mr. Cresson stated that according to his observations, covering more than a quarter of a century, our northern storms are always preceded by a rise of the barometer and a remarkably transparent atmosphere. After the centre of the storm has passed, the barometer usually falls somewhat suddenly, the wind veers to west and northwest, with cool and very dry air.

Every great rise of the barometer is not always the precursor of a northeast storm. Such a synclinal wave sometimes results from other causes, and is then accompanied by extreme cold and dryness, such as would result from a downflow of air from a very high and cold region. An instance of this kind occurred on the 7th of January, 1866. Thermometer, 18°. Barometer, 31″10.

Pending nomination Nos. 568, and new nominations Nos. 569 to 572, were read.

On motion of Mr. Fraley, the Secretary was instructed to furnish the Royal and National Library of the Kingdom of Bavaria, at Munich, with a copy of the new series of the Transactions, and the Proceedings.

Mr. P. E. Chase was added to the Committee of Indian Photographs.

And the Society was adjourned.

Stated Meeting, March 15, 1867.

Present, thirteen members.

Dr. Wood, President, in the Chair.

Letters were read from Dr. Joseph Leidy, accompanying a description and an analysis, by Dr. J. Lawrence Smith, of a Meteorite, belonging to the American Philosophical Society, deposited with other minerals in the collection of the Academy of Natural Sciences of Philadelphia; from Dr. B. F. Shumard, St. Louis, March 4, 1867, inclosing his photograph; from the Ordnance Department, Southampton, England, 18th February, 1867; also from the Essex Institute, Salem, Mass., December 19, 1866, accompanying a prospectus of the American Naturalist, and requesting brief reports of the proceedings of the Society for publication therein.

Donations to the Library were announced as follows: From the Essex Institute; from the Department of State at Washington; from the Managers of the Philadelphia Gas Works; from the College of Pharmacy; from Thomas C. Amory, Boston; and from the publishers of the Medical News and Library.

Prof. Cresson announced the death of Prof. John H. Alexander, a member of the Society, at Baltimore, on the 2d inst.

The death of Prince Maximilian Zu Weid, as occurring in the 85th year of his age, on the 3d of February, was announced.

The following communication was read from Dr. J. Lawrence Smith, of Louisville, Kentucky:

A new Meteoric Iron from Mexico.

A fragment of this meteoric mass was placed in my hands by Dr.

Joseph Leidy, of Philadelphia, with the following statement of its history:

"Some time ago the American Philosophical Society deposited its natural history collection with the Academy of Natural Sciences. In the collection of minerals, there was a special lot of Mexican minerals presented by Mr. Poinsett, who was at one time United States Minister to Mexico. The minerals consisted of rich silver ores, &c., and among them, this specimen of meteoric iron, which was labelled 'Native Silver, Mexico.' It appears to be an entire meteorite, exhibiting nowhere a cut or broken surface; one end, however, was much crushed, as if the specimen had been used for a hammer. The present weight of the specimen is thirty-six hundred grains; it is two inches long, one and a half wide, and one and a half inches high in the middle, and slopes irregularly towards each end. The face from which the piece sent was cut is hexagonal, and exhibits a partial crystalline arrangement, without development by an acid."

Its structure is highly crystalline, and on the cut face of the piece I have, the laminæ of the crystals are over one-sixteenth of an inch thick, and crossing each other at the usual angle. The Widmannstätien figures are very strongly developed by lead.

Its specific gravity is 7.72, and its composition shows the usual constituents in the following preparations:

Iron,	91.103
Nickel,	7.557
Cobalt,	.763
Phosphorus,	.020
Sulphur,	trace
Copper,	trace

Although this specimen is spoken of as being a complete meteorite, it not unfrequently happens that fragments of larger masses of meteoric iron, of a very highly crystalline structure, and that have been detached for some time, present the appearance of being complete masses. It is possible that this iron may be a portion of the large mass recently sent to France, from Mexico, by General Bazaine.

J. Lawrence Smith,
Louisville, Ky.

The following extract from a letter of Dr. I. A. Lapham, to Mr. P. E. Chase, dated Milwaukee, March 11, 1867, was read:

"Six years of the observations made here by me, have been re-

duced to uniform temperature (32° Fahr.), and the monthly means found, by officers of the Government survey of the lakes, as follows:

J.	F.	M.	A.	M.	J.	J.	A.	S.	O.	N.	D.	Mean.
29.385	.368	.307	.334	.300	.356	.356	.352	.386	.372	.338	.403	.355.

Projecting a curve with these figures, and drawing a line bisecting the slopes of the several undulations (to represent the earth's orbit), you will find a tide with four maxima and four minima corresponding very nearly with the cardinal points of the ellipse."

Nominations Nos. 568 to 572 were read.

And the Society was adjourned.

Stated Meeting, April 5, 1867.

Present, sixteen members.

Dr. Wood, President, in the Chair.

Letters were read from the Geological Bureau of Sweden, dated November 1, 1866; from the Royal Society of Sciences at Upsal, 1st October, 1866; from the Royal Academy of Naturalists at Vienna, October 30, 1866, severally announcing donations to the Library; also from the Nicolai Observatory at Pulkowa, June 12, 1866; from the Royal Society of Sciences at Upsal, September 15, 1866; from Royal Asiatic Society, London, December 17, 1866; from the Boston Society of Natural History, March 25, 1867; and from the Smithsonian Institution, Washington, February 20, 1867, severally acknowledging the receipt of publications of this Society.

Donations for the Library were announced, viz.: From the Imperial Russian Geographical Society; from the Nicolai Observatory at Pulkowa; from the Bureau of Geological Research of Sweden; from the Imperial Society of Naturalists at Moscow; from the Royal Society of Sciences at Upsal; from the Royal Academy of Sciences at Vienna; from the

Royal Academy at Munich; from the Royal Dublin Society; from the London Geological Society; from the London Meteorological Society; from the Royal Asiatic Society, London; from the Royal Institution of Great Britain; from the Ordnance Survey Office of England; and from the Franklin Institute.

Mr. Fraley announced the death of John Penington, a member, which occurred on the 18th March, 1867, in the 68th year of his age.

Mr. P. E. Chase made some remarks upon an apparent discrepancy between the tidal theories of Delauney and Airey.

Dr. H. C. Wood, Jr., made the following remarks:

Mr. President: My apology for the following account of some investigations, which I have recently been engaged in making, must be the interest they have excited in myself, and the fact, that they are confirmatory of the life history of the European congeners of the plant, as worked out by Pringsheim, Henfrey, and others, and that they are the first observations that I know of on an American form. The little plant constitutes the filamentous confervoid growth, which has so annoyed the aquaria cultivators in this city. The specimens which were studied, grew spontaneously on the Hornwort (Ceratophyllum) in my aquarium. It without doubt belongs to the genus Œdogonium. The growth of the filament takes place by the formation of new cells, both amongst the older ones and at the distal free end. When an old cell is about to undergo division, a small streak-like fissure appears near its distal end, dividing entirely the outer cellulose wall. This takes place principally in those cells which are well filled with a greenish granular protoplasm. The latter now increases in length, becoming at the same time less dense, more transparent, and soon separates the two sundered parts of the old cell-walls, bearing the upper portion like a little cap on its distal end. As soon as the fissure is well pronounced, a partition separating the lower portion of the old cell begins to be apparent, and the new portion is cut off and commences its existence as an independent cell. In a very little while a cellulose wall is formed, and the cell having attained sufficient size, recommences the process which gave it birth.

The distal cells appear to grow by a kind of pullulation, from the primordial utricle, a portion of the distal end of the terminal cell elongating into a long cell, whose calibre of course does not equal that

of its parent. This continues to grow in length, without increasing very greatly in diameter, and, without obtaining any endochrome, gives origin to a new cell of still less calibre than itself by the same process of pullulation, which is repeated again and again, until finally a number of cells are produced, severally of less diameter than the preceding, none of which contain endochrome. In this way a filament is formed, which gradually tapers to a long slender point and is ended by a very narrow cell, apparently consisting simply of a primordial utricle. Reproduction in this plant takes place both by zoospores and resting spores. In the formation of the former only a single cell is concerned. The whole endochrome of such a cell contracts itself into a mass of a more or less globular shape. When the zoospore is sufficiently developed to enter upon its independent existence, an opening for its exit is obtained at the distal end of its parent cell by the separation of the two cells, in a sort of hinge-like manner, they remaining attached at one corner. No ciliary motion takes place before the exit of the zoospore, but the latter is coated by a thick gelatinous layer, and the motion during its passage from the cell is so slow as to be scarcely perceptible. In a little while this gelatinous coat dissolves off, the zoospore begins to exhibit a rocking motion, oscillates more rapidly, and finally darts off on its career.

According to Mr. Henfrey, some of these zoospores develop into the ordinary filament, whilst others on germinating produce only male plants; of this I cannot speak, as I have never seen a zoospore develop. When a resting spore is about to be formed, two cells join themselves, the proximal cell of the two emptying its endochrome into the other, through an opening in the wall, which becomes very much swollen and crowded with the contents of the two, and finally assumes in our species a somewhat globular form, with its contents gathered into a dense protoplasmic ball, not filling the case. Whilst this has been going on in our species, the male filaments appear, generally on the emptied cell; at first this is composed of a single cell, but in a little while a second distal one is formed, and finally spermatozoids appear in the latter; never that I have seen more than two being formed in the species under consideration. The spermatozoids differ from the zoospores, in that they are much smaller and are not colored green. At this time an opening takes place in our species, in the proximal portion of the sporangium, through which it is said the impregnation takes place by the entrance of the spermatozoids. I have watched the latter swimming around the orifice, but have never

seen them enter. After impregnation I believe the opening closes, though this point is not absolute, and the spore matures, changing from its dark green to a dark reddish-brown.

The species whose life history I have studied, is nearly allied to Œ. Rothii of Europe, but is I believe distinct and undescribed. I would offer for it the name Œdogonium Huntii, after Dr. J. G. Hunt, to whose aid and direction, whatever success may attend any microscopical researches I may make, will be due. I append a technical description.

Œdogonium Huntii. Gynandrous. Male plant slightly curved, attached by a small foot, generally, to the cell which has been emptied in making sporangium, two-celled; sporangium round, often somewhat hexagonal, slightly expanded in the middle, opening below the median line. Spore globular, not filling its case, furnished with four raised ridges, about $\frac{1}{500}$th of an inch in diameter.

The color of this plant is a bright yellowish-green, deepening to a very dark green in cells which are crowded with granular protoplasm. The size of the filaments varies very much; the largest attain a diameter of $\frac{1}{600}$ of an inch. All of the zoospores which I have seen were globular.

Prof. Cresson described a brilliant meteor which he observed at about 7h. 40′ this evening.

Nominations Nos. 568 to 572 were read.

The President announced the names of the committee to aid the trustees of the fire-proof building fund.

And the Society was adjourned.

Stated Meeting, April 19, 1867.

Present, nineteen members.

Prof. Cresson, Vice-President, in the Chair.

Letters were read from Rear Admiral Davis, United States Navy, dated March 20, 1867, announcing a donation to the Library; also from a number of gentlemen of Philadelphia,

dated April 11th, 1867, asking the co-operation of the Society in the erection of a monument to the memory of Prof. A. Dallas Bache.

Donations for the Library were announced as follows: From the Royal Saxon Society of Sciences at Leipsig; from the Geographical Society at Paris; from Bailliere's, Paris; from the Royal Astronomical Society, London; from J. Y. Simpson, Edinburgh; from the Boston Natural History Society; from the Trustees of the Free Public Library of New Bedford; from the Essex Institute; from the editors of the American Journal Natural Sciences and Arts; from the Adjutant-General U. S. A.; from Rear Admiral Davis, U. S. N.; from Prof. A. D. Bache of the Coast Survey; from the Department of State at Washington; from Dr. T. S. Kirkbride; from the Mercantile Library, Philadelphia; from the Franklin Institute; from the publishers of the News and Library; from Rev. Albert Barnes, and from Isaac Lea.

Pending nominations, Nos. 568 to 572 were read, and the Society proceeded to the balloting for the candidates for membership.

New nomination No. 573 was read.

The subject embraced in the communication from a number of citizens, read this evening, was considered, and the following resolution was adopted:

Resolved, That a committee be appointed to collect subscriptions for the erection of a monument to the memory of Prof. Alexander Dallas Bache.

The committee consists of Prof. Kendall, Mr. Fraley, and Mr. Thomas P. James.

On motion of Mr. Fraley, it was

Resolved, That a committee be appointed, to meet with similar committees to be appointed by the literary and scientific societies of Philadelphia, for the purpose of ascertaining whether portions of Penn Square can be obtained from the authorities of the city of Philadelphia, as sites of edifices for the proper accommodation of such societies.

The committee consists of Mr. Fraley and Mr. Eli K. Price.

The ballot-boxes being opened by the presiding officer, the following persons were declared duly elected members of the Society:

Prof. Hubert A. Newton, Yale College, New Haven, Conn.

Prof. Arnold Guyot, Nassau Hall, Princeton, N. J.

Mr. F. B. Meek, Smithsonian Institution, D. C.

Brevet Brig. Gen. William F. Raynolds, U. S. A., Detroit, Michigan.

Hon. Morton McMichael, Mayor of the City of Philadelphia.

And the Society was adjourned.

Stated Meeting, May 3, 1867.

Present, nineteen members.

Dr. Wood, President, in the Chair.

Rev. Dr. Osborn and Hon. Morton McMichael, recently elected members, were presented and took their seats.

Letters were read from H. A. Newton, dated Yale College, April 29, 1867, F. B. Meek, dated Washington, D. C., April 25, 1867, W. F. Raynolds, dated Detroit, April 26, 1867, and Morton McMichael, dated Philadelphia, April 23, 1867, severally acknowledging the receipt of a notice of their election and accepting membership in the Society; also, from C. F. Hagedorn, Consul-General of Bavaria, dated Philadelphia, March 18, 1867, on behalf of the Royal and National Library at Munich; from the Royal Society of Sciences at Göttingen; from the Natural History Society at Nüremberg; and the Massachusetts Historical Society, acknowledging the receipt of publications of the Society; and from the Royal Public Library of St. Petersburg; from the Royal Prussian Academy at Berlin; from the Royal Society of Science at Göttingen;

from the Natural History Society at Nüremberg; from the Royal Bavarian Academy at Munich, each announcing the transmission of their publications.

A letter addressed to the President was read, signed J. Vaughn Merrick, secretary, dated April 29, emanating from the meeting of the committee of gentlemen held to consider the subject of erecting various public buildings on Penn Square.

The death of Dr. George Frederick V. Jager, a member, was announced as having occurred on September 18, 1866, aged 80 years.

Dr. Hayden exhibited a series of photographs of the Dakota Indians.

Prof. Cresson made some remarks on the subject of explosions in mines, and described a recent explosion which took place in a mine of the Salem Coal Company, Schuylkill County, where the severity of the explosion was much increased by the perfect ventilation of that mine.

Pending nomination No. 573, and new nominations, Nos. 574 to 576 were read.

The subject of the Michaux Legacy was discussed and referred to a special committee for investigation.

On motion of Mr. Fraley,

Resolved, That the Society approve of the project of appropriating the Penn Squares as sites for the buildings of institutions named in the resolution of the committee presented at this meeting, and that a committee be appointed to confer with like committees from other institutions, and to co-operate with them in carrying the proposed plan into effect.

And Prof. Cresson was added to the committee.

On motion of Prof. Cresson, ordered, that fifty dollars additional be appropriated for Indian photographs.

And the Society was adjourned.

Stated Meeting, May 17, 1867.

Present, seventeen members.

Judge SHARSWOOD, Vice-President, in the Chair.

Letters were read from the Prince Jablonowski Society at Leipsig, March 1, 1867, accompanying a donation; also, from the Academy of Sciences at Paris, September 29, 1866, and from the College of Pharmacy, March 5, 1867, acknowledging the reception of publications.

Donations for the Library were announced: From the Prince Jablonowski Society at Leipsig; from the Upper Lausatian Society at Görlitz; from the Royal Zoological and Botanical Society at Vienna; from the Royal and Imperial Zoological Society at Vienna; from M. Baillière, Paris, the Annales des Mines; from Martin Lauzer, Paris; from the Royal Astronomical Society of London; from Prof. Goeppert, Paris; from the Public Library, Boston; from John Meredith Read, Jr., Albany; from Brantz Mayer, Baltimore; from Rhode Island Society for the Encouragement of Domestic Industry; from editors of American Journal of Sciences and Art; from the Mercantile Library, San Francisco; from Henry Phillips, Jr., Philadelphia; from the Academy Natural Sciences, and the publishers of the Medical News and Library, Philadelphia.

The decease of Dr. J. T. Goodsir, of Edinburgh, was announced as occurring March 6, 1867, aged 52. Also, of Bishop Stephen Elliott, of South Carolina, on the 22d December, 1866, members of this Society.

The minutes of the Board of Officers and Council, at their last meeting, were read.

Pending nominations Nos. 573 to 576, and new nominations Nos. 577 to 579 were read.

Mr. Price, of the committee on the Michaux Legacy, submitted a report of its condition and a resolution, which was adopted.

And the Society was adjourned.

Stated Meeting, June 21, 1867.

Present, five members.

Mr. F. FRALEY, in the Chair.

Letters were read from the Physical Society of Berlin, February 18, 1867, and the Imperial Academy at Vienna, February 20, 1867, announcing donations to the Library. Also from the Superintendent of the Geological Survey of India, and the Physical Society of Berlin, acknowledging the receipt of publications.

Donations were announced, viz.: From the Royal Prussian Academy, from the Royal Prussian Union for Gardening and Plant Culture, and from the Physical Society at Berlin; from the Royal Academy of Sciences at Vienna; from the Royal Academy at Madrid; from the Society of Antiquaries, from the Chemical, from the Meteorological, and from the Royal Astronomical Societies of London; from M. Baillière and from M. Delesse of Paris; from the New Hampshire Historical Society; from the Boston Academy of Arts and Sciences; from the Worcester Lunatic Asylum; from the Young Men's Association of Buffalo; from the Albany, from the Wilmington, and from the Franklin Institutes; from the Friends' Association of Philadelphia; and the Editors of News and Library.

Pending nominations Nos. 573 to 579 were read.

Mr. Fraley from the Committee on Sites for Edifices on Penn Squares, reported progress.

And the Society was adjourned.